

## SOLAR HOME SYSTEMS

Clean, Renewable & Affordable  
Electricity for the Countryside

A Guide  
To Program Development



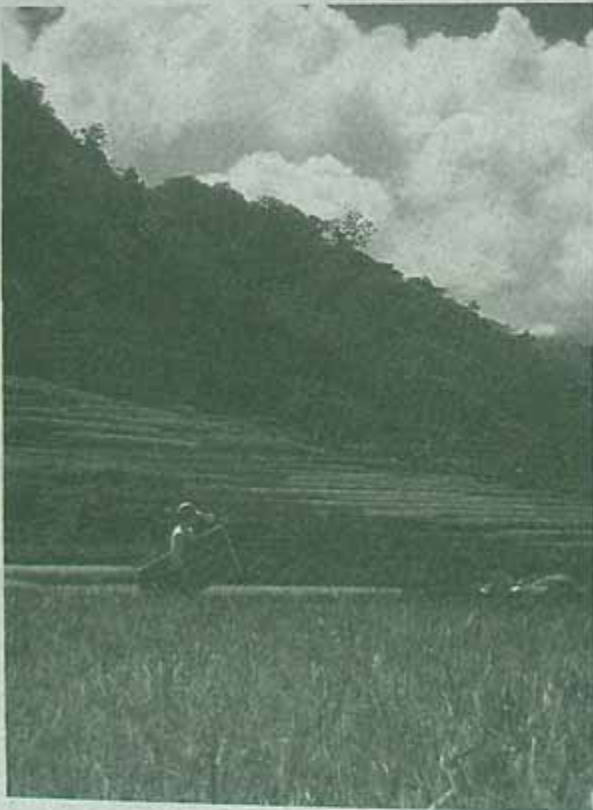
# Countryside Development

The Philippines is part of the world's most dynamic growth regions and its population of more than 60 million people is eager to accept their share of the nation's economic development. Executives pursue the noble task of leading their constituents towards the vision of *Philippines 2000*.

This also means catching up with the national infrastructure and basic public services made difficult by inaccessible terrain and the archipelagic geography. Electricity supply continues to be an inaccessible public service for more than half of the rural population. It should not be confused with power generation. Under the policy that power follows development (and not vice versa) basic electrification is much rather a social service that primes countryside development. Giving light and access to news extends people's productive time beyond sunset and facilitates information which contributes greatly to the education of mature citizens.

In recent years countries such as Indonesia and India have made inroads in tapping solar energy for large scale rural electrification. In the Philippines as well the bilateral cooperation of the National Electrification Administration (NEA) and the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) under the *Philippine-German Special Energy Programme (SEP)* demonstrated during the last 8 years to the benefit of more than 1700 households that solar technology can be successfully employed to provide a basic electrification service that is reliable and affordable.

This brochure is intended for the guidance of executives who want a briefing on the potential of solar energy and the steps to be taken to get its beneficial use. It serves as an overview and quick reference on the actual subject of *Rural Photovoltaic Electrification*. For further reference the SEP Publications "SEP Project Documentation" and "Guide for Financial Institutions" are available.



# Benefit And Cost

**Solar Home Systems** employ the photovoltaic (PV) effect by converting light directly into electricity. This conversion takes place directly where it is needed and eliminates the problems of transmission in the difficult terrain. Solar Home Systems make it possible to operate DC appliances throughout the day. They comprise of two groups:

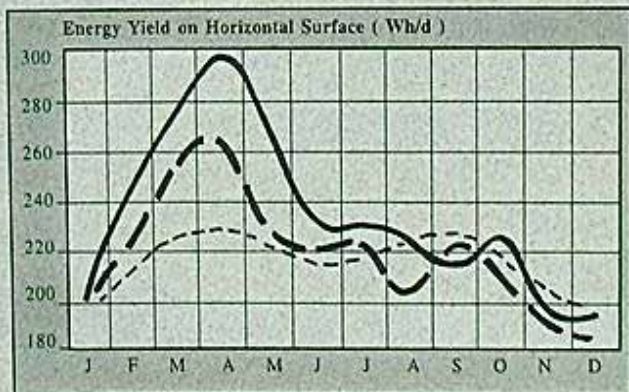


o The solar panel, controller and outdoor installation from the "generator". (see out buttons in sketch).

o The storage battery and all of the individual in-house installation make the "Balance of System" BOS (see "in" buttons in sketch).

All BOS components are being manufactured locally and quality tests are performed by the "Fuel and Appliance Test Laboratory" of the Department of Energy.

The country's tropical location provides year-round energy yield of around 218 Wh/d from a 70 Wp panel, which is sufficient to operate at least 3-5 energy-saving lights, radio and TV and thus meets the demand of most rural families.



Annual energy output profile of 70 Wp panel

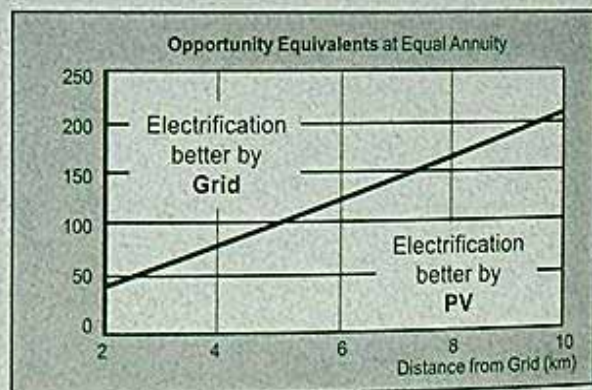
Solar Home Systems were found to operate safely even during typhoons and are designed with sufficient storage capacity to allow for load peaks and bad weather periods. SHS turned out to be the most popular PV supply concept and among the various financing models developed, were found to be within the reach of a large number of rural consumers. Electric Cooperatives offer an SHS at a cost covering rate of P 190. It was further found that because SHS is an individual home energy supply people take the

responsibility for the proper handling of their own little "plant", besides appreciating the freedom of being able to put them up in almost any location.

Photovoltaic technology which was often deemed expensive now turns out to be the least cost option. This is not surprising considering that whatever cheap power new and efficient power plants may provide will not benefit the single remote island or mountain household because the cost of distribution by far outweighs the cost of generation.

## Public Grid

Line extension cost is independent from the number and load of household connections but needs a certain load to be feasible. It is safe to say that today all feasible extensions have been made while only half of the rural homes have been covered. The remaining mostly have small consumption and would pay a minimum of about P 50 flat. Extending lines there would require a dramatic price increase or a permanent subsidy.



Line of equal opportunity by household/distance for 70 Wp system

## Diesel Generator

The usual alternative is a small village generator set which offers typically 4 hours service at P 2 for each light per day. Therefore a household with three lights pays P 180 each month, about the same as the service fee for a Solar Home System which, in addition, offers a full day of service. Other problems with GenSets are permanent fuel consumption, fumes, smoke, and noise, and the high breakdown rate which leaves the entire village in the dark until a costly repair is arranged.

Note, that generator sets are designed to cover the maximum possible power (VA) while PV systems with storage battery are designed for the average energy demand (Wh). An SHS of 50 Wp can operate some 100 W for a given time.

# More Cooperators

In addition to the PV Electrification service available through NEA and the ECs, other implementors like the private sector and NGOs demonstrated the ability to complement the public service. Government organizations can effectively contribute to the awareness by demonstrating PV applications through their field offices and programs.

## Private Sector

Commercial suppliers were able to team up with rural communities to install and even service electrification projects. In addition to offering corporate financing, projects were funded from regional budgets or enjoyed foreign support. Examples other than the German assistance (which is untied), is the export promotion support for projects by the Netherlands and Australia.

**Note, that implementors should comply with existing standards and not only install the systems but also provide the necessary after sales service. This does not require extensive or expensive service networks but efficient service response to support their customer - forever.**

## Non-Government Organizations

Local user associations or established NGOs show a high motivation to launch PV Electrification projects when they are supported by suppliers or foreign assistance. It is important to assure their long-term service commitment.

## Government Offices

Existing experiences of Government units with PV applications are on communications and signaling. Local Government Units increasingly consider PV-applications for service in far-flung areas where complementary funding is available. Objectives will aim towards social service like schools, hospitals or water supply. The Philippine-German PV Pumping project received valuable support from DOE and Local Government offices. It is crucial to provide these projects with a long-term maintenance budget.

# Public Support

PV-Electrification like any other public service needs the backing and support of public officers both on the national and local level. This is to assure that the endeavor enjoys an open and level playing field, that it is properly considered in development plans and will not be subjected to controversial objectives. Several bills have been proposed to further establish and foster the role of renewables in general and PV-Electrification in particular, with the goal of ascertaining conducive regulations.

## Funding

In addition to the financing available through NEA there are also short and medium term loans available on similar terms through the Window III facility of the Development Bank of the Philippines.

## Subsidies

For some depressed areas in the Philippines subsidies of the national government are granted to facilitate electrification. These subsidies are administered by the NEA. Often the amounts are not sufficient for the desired grid service but are enough for PV-Electrification. Subsidies can be used to lower or eliminate first cost of the solar generator so the monthly payments can be reduced substantially to serve only the cost recovery and operation.

CDF is another valuable public subsidy which can contribute in lowering the first generator cost. It is not advisable to use subsidies to shoulder the cost of the BOS and make it easy to join PV-Electrification. BOS payment is a necessary indicator for the household's ability and willingness to pay the solar services. It is also a recurrent cost so households who need a subsidy to buy a first battery may not be able to buy the subsequent replacements. A public subsidy will only help a project if it is available at the right time and unconditionally.

**Note that subsidies are not required for the RPE but may help accelerate development. Subsidies ought not to be applied to recurrent cost.**

## People Response

Rural households do not ask for much. In fact surveys showed that even after years of grid service, their consumption rarely went beyond the basic need for lighting, TV and radio, and that only 5% were actually investing in a refrigerator or a flat iron. While this demand is too low to justify a feasible grid extension, it is exactly the range to be efficiently served by a Solar Home System.

People do not value electricity by its source but by the quality of service it provides. SHS were seen to offer a satisfactory service at an affordable cost. Women appreciate their being able to gain extra daytime hours by shifting household chores to the evening. The family can spend more time together and children are better able to attend to their homework. On radio and TV, the aspect of information and education has clear priority as news features and children's programs rank ahead of sports and entertainment.

Surveys showed that SHS-users were more satisfied with the service than grid-users. People in unenergized sites, although aware of the higher cost, consider the grid less reliable and more dangerous, and would prefer the SHS.

# Rural Photovoltaic Electrification

## Concept

A main result of the bilateral SEP cooperation of GTZ, NEA and the Electric Cooperatives was the development of the Rural Photovoltaic Electrification (RPE) scheme. A distinguishing feature of the RPE concept

implemented by the power sector is that the Electric Cooperatives finance, own, and operate Solar Home Systems. Customers are charged a service fee of only P 190 and pay for their individual BOS. NEA funding assures that service fees remain reasonably low. The ECs have the sustenance to guarantee a long term service and use their local structure for technical services, customer relations and collection.

Electric Cooperatives welcome SHS as an addition to their service portfolio and SHS-users are regular members.

ECs most experienced in RPE implementation and awarded for their performance are CAPELCO; ILECO-III; ILECO-II; INEC; KAELCO; DANECO and COTELCO.

### RURAL PHOTOVOLTAC ELECTRIFICATION

The Electric Cooperative		
Finances	Owns	Operates
	which facilitates	
low interest rates	planning	warranty
long term loans	extension	replacement
low service fees	expansion	maintenance
safe financing	re-location	repair
easy processing	re-possession	information
cost recovery	insurance	installation

## Eligibility

Communities or clusters of households in unelectrified villages qualify for RPE when they show the ability to buy initial Balance of System and hence pay the monthly service fees. A potential analysis by the SEP indicates that about **one million** households which corresponds to one third of the as yet unelectrified homes indeed can afford the RPE service.

## Application

The EC receives the application and performs a site appraisal. The SEP has developed appraisal tools which help to reach an objective assessment. The EC requires that a cluster of at least twenty households in a target area will enroll. Their managers and technicians have attended special RPE training before they apply for a loan from NEA. The EC will also enter into a commitment to consistently monitor the installations to assure the best service.

### PROJECT DEVELOPMENT CHART

<input checked="" type="checkbox"/>	design system configuration
<input checked="" type="checkbox"/>	develop payment scheme
<input checked="" type="checkbox"/>	identify site
<input type="checkbox"/>	appraise site, check options
<input checked="" type="checkbox"/>	install demo system
<input checked="" type="checkbox"/>	conduct information drive
<input type="checkbox"/>	enroll applicants
<input type="checkbox"/>	secure financing
<input checked="" type="checkbox"/>	procure material
<input checked="" type="checkbox"/>	test components
<input checked="" type="checkbox"/>	train technicians
<input type="checkbox"/>	collect Balance of System
<input checked="" type="checkbox"/>	install systems
<input checked="" type="checkbox"/>	train users
<input type="checkbox"/>	organize maintenance
<input type="checkbox"/>	organize collection
<input checked="" type="checkbox"/>	supervise operation

## Supply

With the financing from NEA, the ECs conduct a public bidding among the accredited suppliers in the Philippines (see list on back page). The PV-generator cost will run for about P 600,000 for a batch of 50 households. Direct procurement offers the advantage that after sales service, extensions and warranty become easier to obtain. Solar systems are exempt from import duties in the Philippines.

## Service

The EC is responsible for the monitoring, maintenance and repair of the Solar Home Systems, and will train the individual households to operate their systems properly and perform simple maintenance and trouble shooting tasks.



**ACCREDITED SUPPLIERS:**

**BP SOLAR (PHILIPPINES)**

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**CC. UNSON COMPANY, INC.**

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**FIRST PHIL. ENERGY CORP.**

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**FLORO ENT. INT'L CORP.**

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